

Trauma 101 and Systems Design

Bill Jermyn, DO, FACEP

THE VANDIVER GROUP, INC.™



Right Care. Right Place. Right Time.

“Inattentional Blindness”

- “Opaque gorilla” video experiment
- Why humans make poor eyewitnesses
- We focus on one task and cannot take in the entire picture
- The success of this project requires a view of the entire picture.

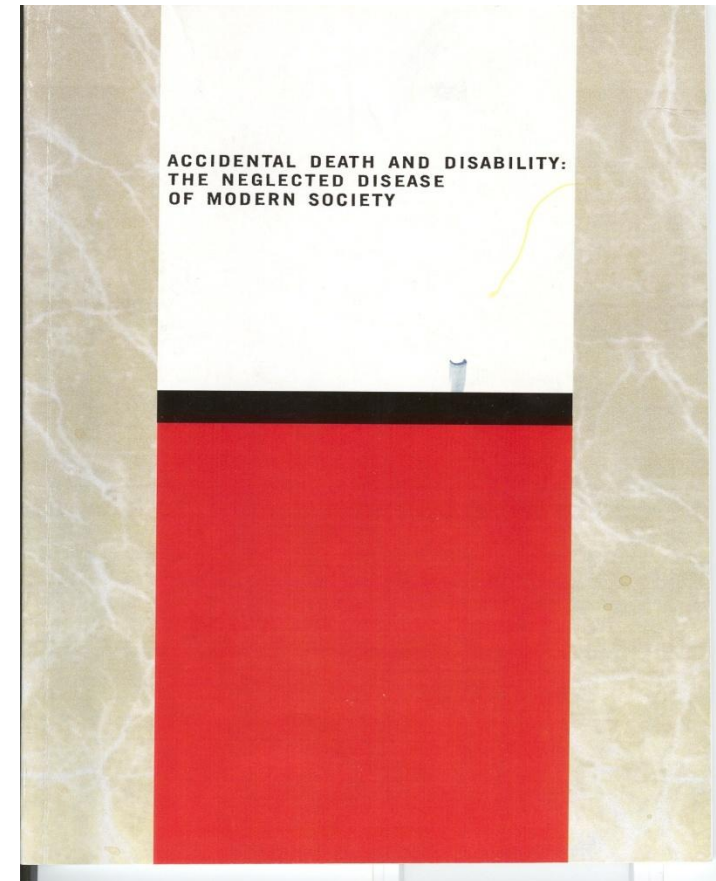
Missouri's experience is much richer than most other states.

- SAC-EMS
- Trauma System
- HDSP Pilot Project
- A history of collaboration

Trauma System history and some “Lessons Learned”

1966

- “Local political authorities have neglected their responsibility to provide optimal emergency services.”
- “Under medical leadership, national forums should be conducted at the highest levels on all subjects important to total emergency care from the time of receipt of an injury through rehabilitation.”
- “The general public is insensitive to the magnitude of the problem of accidental death and injury.”



“It is generally agreed that the basis of any trauma care system includes optimal resuscitation and rapid transport from the scene of an accident to an appropriate hospital that can provide definitive care. There is controversy over what constitutes an appropriate hospital.”

West JG et al. Systems of Trauma Care: A study of Two Counties. Arch Surg: April 1979, 114; 455-460.

Trauma System Changes

Year	Nation	Missouri
1966	<ul style="list-style-type: none">•Accidental Death and Disability•National Highway Safety Act (PL 89-564)	<ul style="list-style-type: none">•Authority and Funds for Mo-DOT for EMS

Trauma System Changes

Year	Nation	Missouri
1969	•MD Institute of Emergency Med forms	
1966- 1970	•Three states form trauma systems (MD, IL, FL)	

Trauma System Changes

Year	Nation	Missouri
1971 1970's	<ul style="list-style-type: none">•MVC deaths reduced due to "modern medical care system"•Advances continue- regional trauma systems (IL)	<ul style="list-style-type: none">•Ambulance district authority (SB 108)

Trauma System Changes

Year	Nation	Missouri
1973	•Emergency Medical Services Act (PL 93-154) authorizes grants-EMS regions (to block grant 1981)	
1979	•MVC mortality differences Orange Co vs. San Francisco	

Trauma System Changes

Year	Nation	Missouri
1981	•Block Grants— for EMS	•PHHS Block supports EMS services (current)
Early 1980's	•Orange Co trauma system implemented	•Trauma system center designations based on self- assessment
1984	•Orange Co preventable deaths drop from 34% to 15%	

Trauma System Changes

Year	Nation	Missouri
1985	• <i>Injury in America</i>	
1988		•Trauma Committee—
1990	•Trauma Care Systems & Development Act (PL 101-590) Authorizes funding through 1995- one size did not fit all	Outside reviewers start to verify standards at designated facilities

Trauma System Changes

Year	Nation	Missouri
1998		•EMS statutes revised—6 EMS regions authorized (no funding)
2006		•IOM Report •EMCS Regionalization Recommendation

Trauma System Lessons Learned

- Trauma SYSTEM saved lives
- Accommodate regional and local variations
- Set standards that are agreed upon by all
- Verify compliance with those standards by some objective means

Lessons Learned, cont.

- Gather Quality Improvement (QI) data, analyze it, and use it to adapt and refine the system
- Involve the correct stakeholders
- Design to encourage parallel processing; not sequential
- Examine all aspects of the patient's care

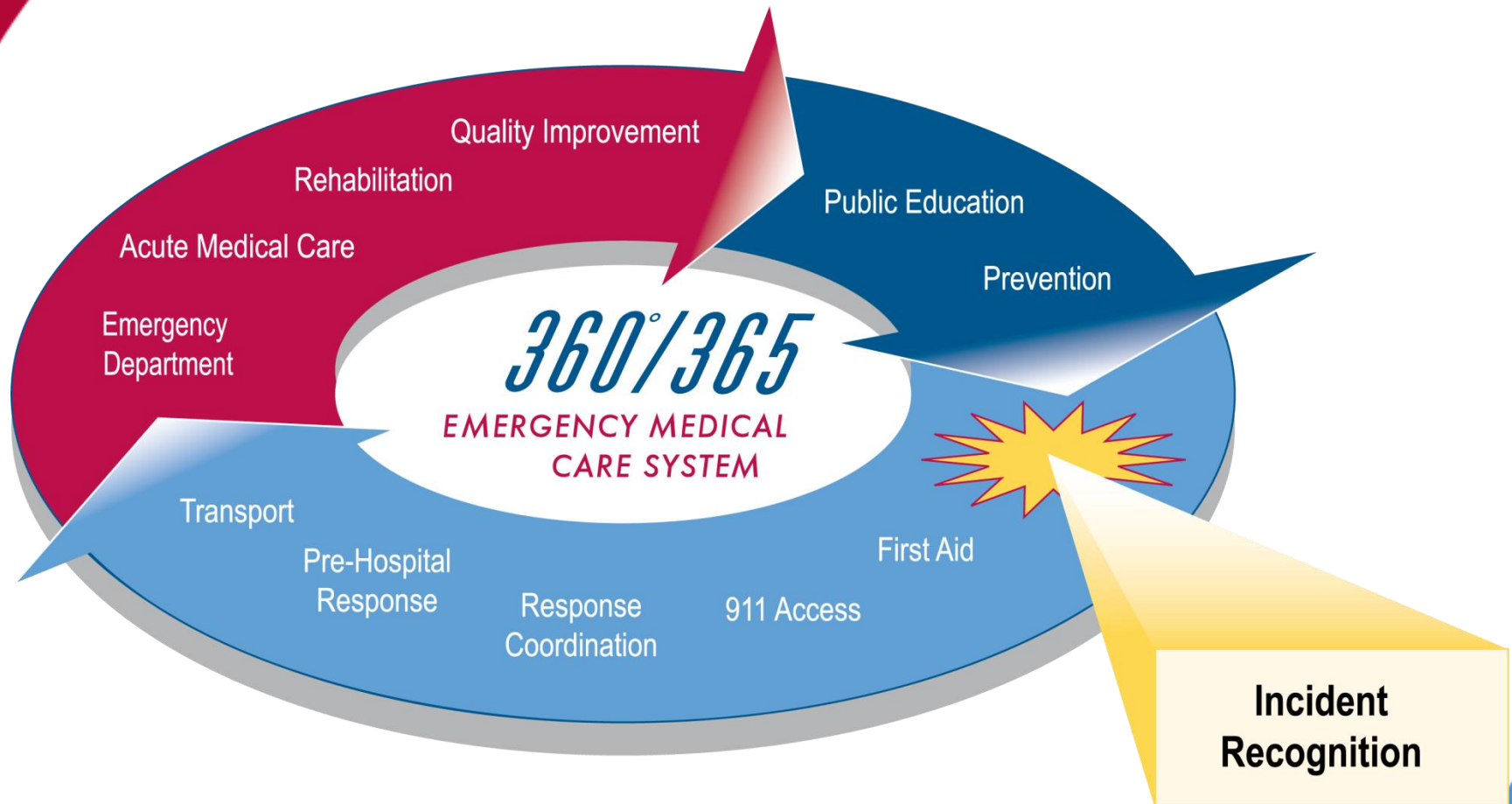
System Design

“Who cares about trauma? I’m no surgeon!

I care about stroke (or STEMI, pediatrics, critical care, etc) and don’t see how this affects me or my patients.”

The Emergency Medical Care System has the same requisite principles, whether you are dealing with trauma, stroke, or STEMI.

This is the elegance of the Circle concept.



What Is Different From Trauma?

- Language, technical, and clinical issues
- Have to work with “those people”
- Registries will need to measure different parameters
- Other issues?

What Are The Similarities?

- “Circle concept” of system of care
- Data collection and data collection platform
- QI process
- Public education
- Importance of early recognition and appropriate transport and triage
(Right Care, Right Place, Right Time)

What Are The Similarities?

- Concepts of “parallel processing” and “moving care forward”
- Need for common time saving measures—leave on EMS stretcher, no drips, one call transfers
- Legislative requirements
- Political mechanism

What Are The Similarities?

- Need for well-trained inter-facility transfer mechanisms
- In-hospital programs that can supplement the overall effort-D2B, GWTG, JCAHO
- Patient outcome improvements require a total system perspective---If it takes 5 hrs to get the patient to the right place, who cares if you save 15 minutes of hospital time?

Why Design Only One System?

- Shared resources (data collection, QI, political, funding, staffing)
- Shared resources increase the odds of successful implementation and viability
- A common system is easier for participants to deal with (hospitals, 9-1-1, EMS, etc)

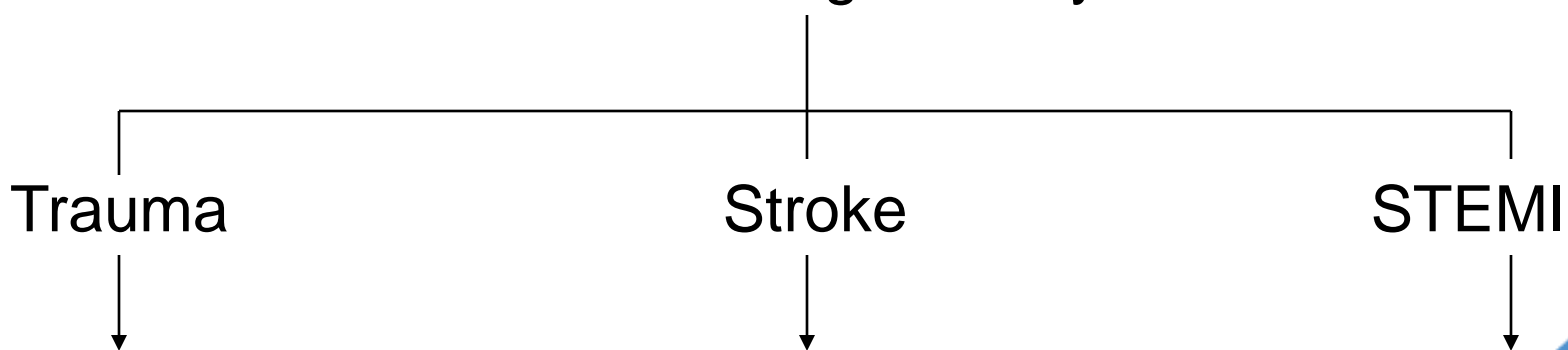
Why Combine The Systems?

- Political strength is more effective if we band together
- QI process easier if we integrate across disciplines and opportunity for “lessons learned” is greater

Why Combine The Systems?

- We work together towards the common goal of improved patient care for those diagnoses that are time dependent. We don't do it separately.

Time Critical Diagnosis System



System Requirements

- Includes all the stakeholders for system design and structure
- Viable and supports patient care
- Means to sustain itself
- Improves care over time-able to refine itself
- Consistent data collection and use to support QI

How is the EMCS different?

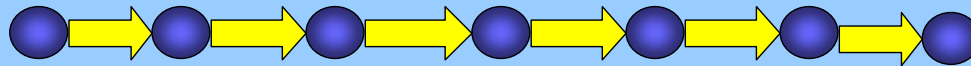
- Society expects emergency care to be available at all times—Emergency Medical Treatment and Active Labor Act (EMTALA)
- Regionalization makes sense for EMCS to appropriately allocate finite resources, decrease costs, and improve outcomes
- There are different parameters imposed by society on the emergency medical care system than apply to the rest of the health care system

Does System Design Matter?

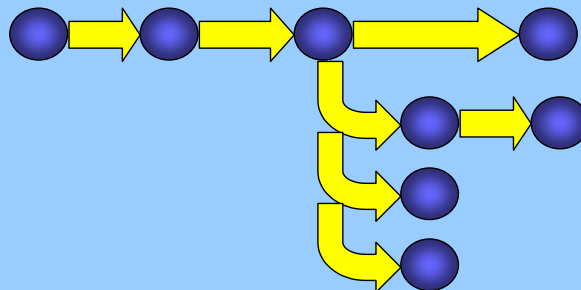
- Self-assessment accreditation processes help some, but independent, outside review teams and center designation improve outcomes even more (DiRusso S et al. Preparation and achievement of American College of Surgeons Level 1 trauma verification raises hospital performance and improves patient outcomes. J Trauma; 2001 Aug. 51(2):294-300.) (Mann NC et al. Systematic review of published evidence regarding trauma system effectiveness. J Trauma 1999 Sept;47(3 Suppl) S25-S35.)
- Formation of a system does not guarantee outcome improvements (Jollis JG et al. Implementation of a statewide system for coronary perfusion for ST-Segment Elevation Myocardial Infarction. JAMA 2007;298(20):2371-2380.)

Does System Design Matter?

Sequential Process:



Parallel Process:



STEMI System

Gross, et al AJC 2007 99(10):1360-1363

- 356-bed community referral center, 3-county rural area, 4 community hospitals and 1 PCI hospital
- 233 consecutive STEMI patients from June 2003-December 2004
- Emphasis on symptom onset to definitive care
- Rapid transfer if “walk-in”, and field triage of paramedic identified STEMI directly to PCI hospital and many times directly to the PCI lab

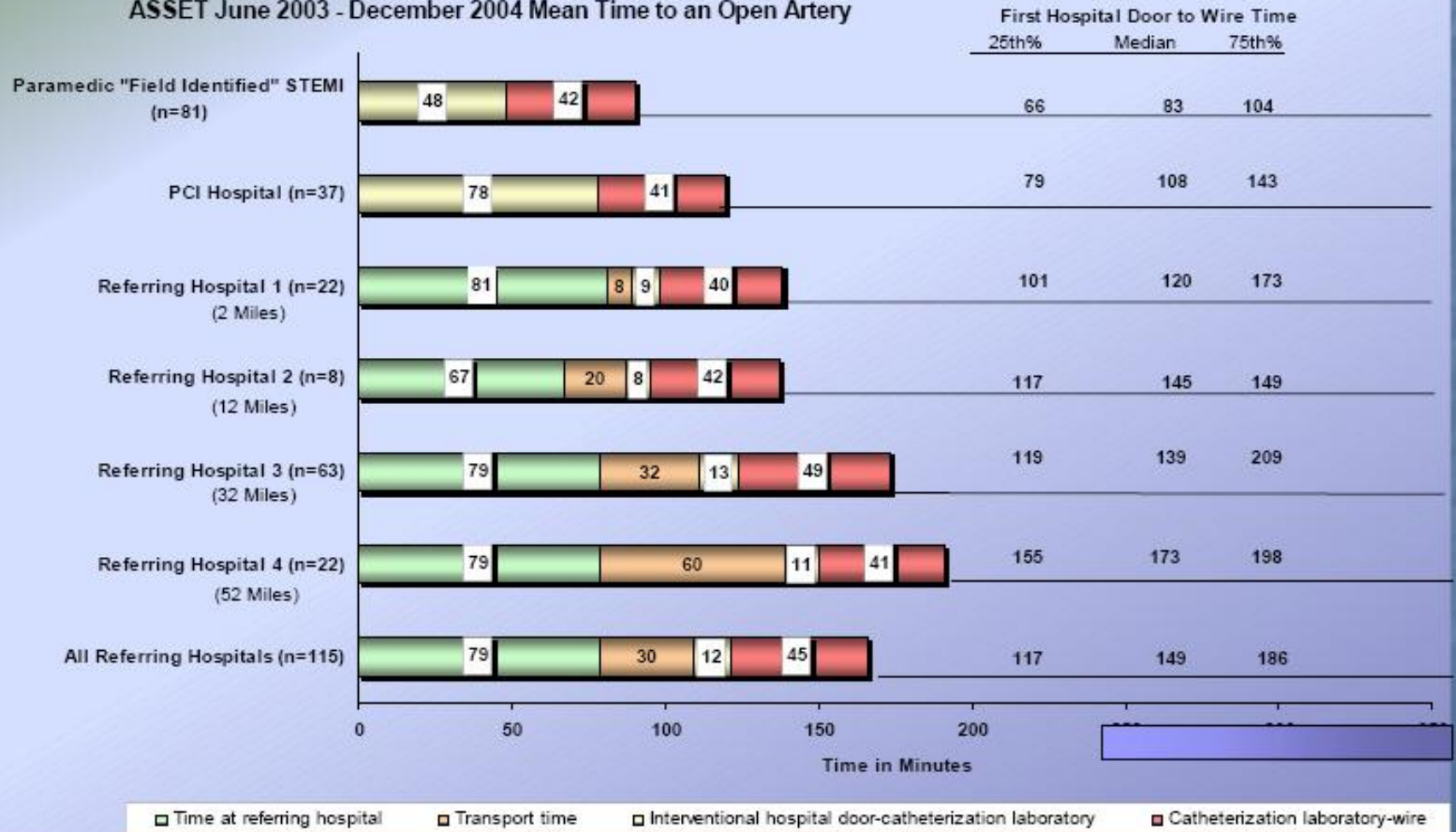
STEMI System

Gross, et al AJC 2007 99(10):1360-1363

- Paramedic identified STEMI times best, by far
- Avg. of 79 additional minutes to balloon time if transferred from another ED after “stabilization”
- In-hospital mortality showed an absolute 6.5% and relative 75.6% reduction when compared with “like” PCI hospital in NRMI -4

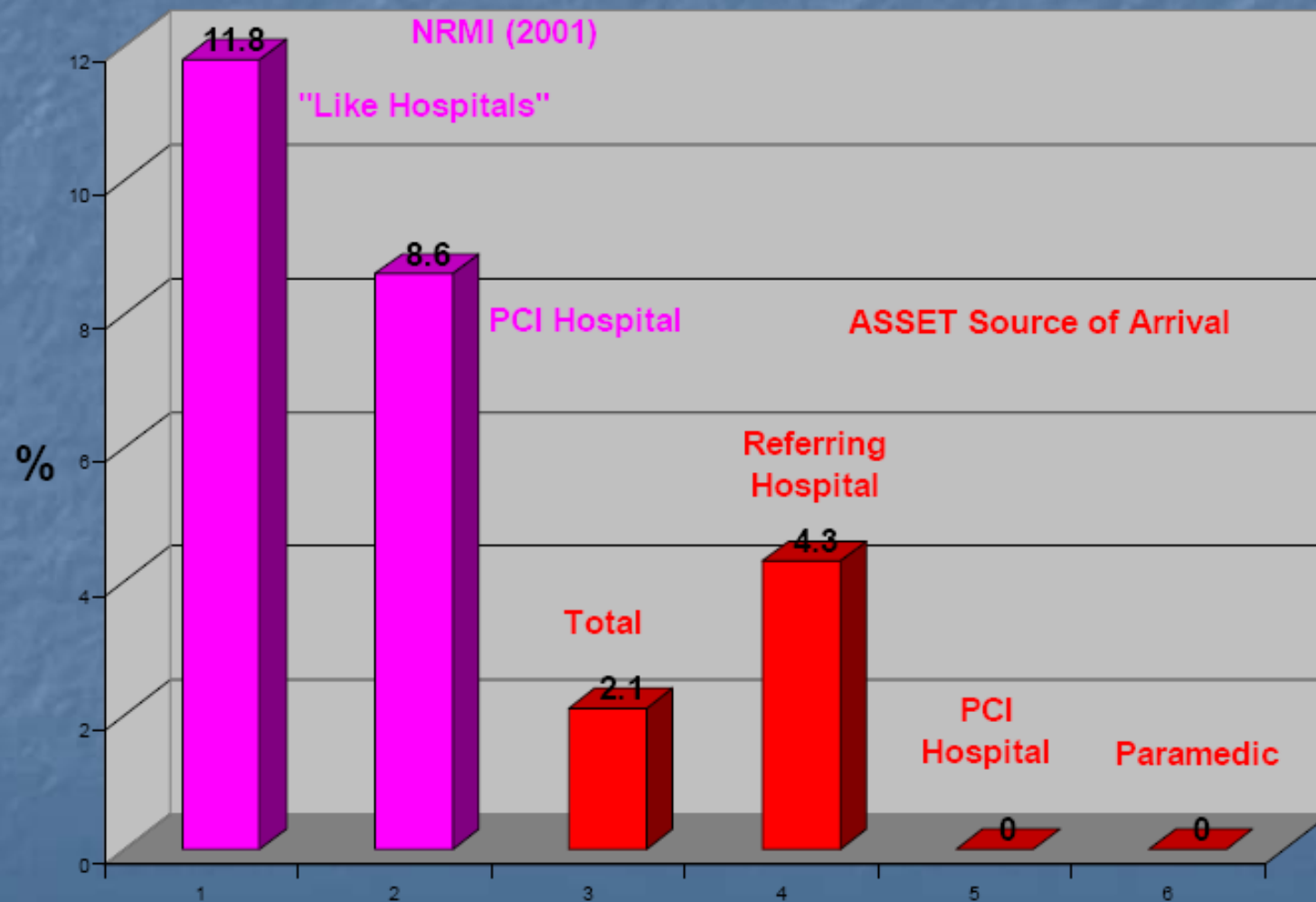
ASSET Door to Wire (June 03-Dec 04)

ASSET June 2003 - December 2004 Mean Time to an Open Artery



STEMI Mortality

In Hospital Mortality



Is this study an aberration?

- Ottawa study shows identical in-house mortality rates and independently corroborates this data
- 108 patients, retrospective cohort, similar system design
- IH mortality was 1.9% (absolute decrease 7% and relative reduction of 78.6%)

GUSTO-1

An International Randomized Trial Comparing Four Thrombolytic Strategies for Acute Myocardial Infarction. NEJM, Sept 2, 1993; 329(10):673-682.

- 1993- compared four thrombolytic strategies
- Accelerated tPA with IV heparin was superior to streptokinase
- Combined end-point of disabling stroke or death was improved from 7.8% to 6.9%. An absolute reduction of 0.9% and a relative reduction of 12%

GUSTO-1

An International Randomized Trial Comparing Four Thrombolytic Strategies for Acute Myocardial Infarction. NEJM, Sept 2, 1993; 329(10):673-682.

- Based on this study, we stopped using the cheaper streptokinase. Most would argue streptokinase is not standard of care.
- We have spent how many billions of dollars for this modest reduction in mortality?
- I'm showing you a way to effect significant change for relatively little cost to the system

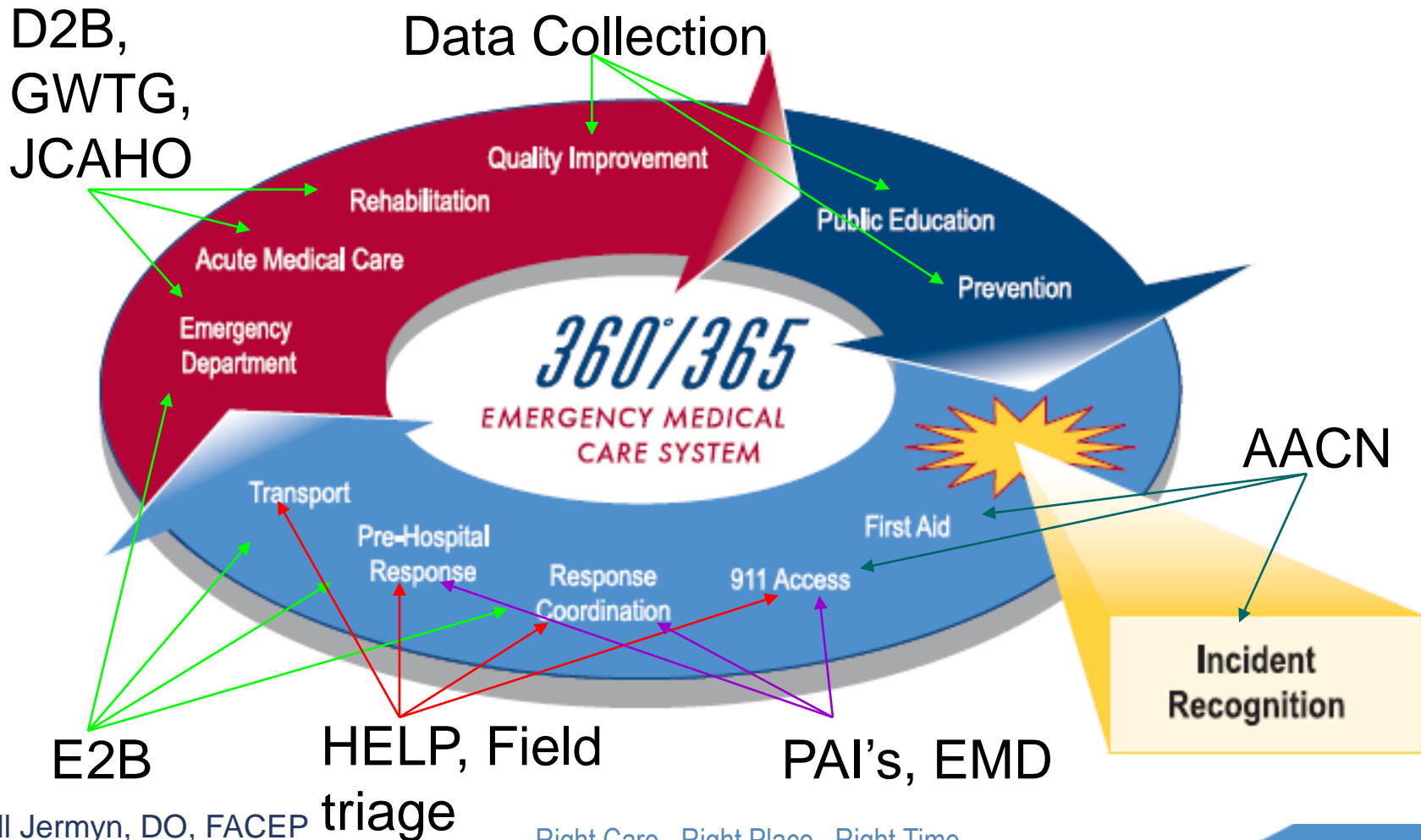
Change

- All it requires is that you examine the entire system, change the way you view the problems, and respond to them
- It costs virtually nothing, but we have to change the way we think and operate

Look At the Entire Picture: Symptom Onset to Definitive Care



Look At the Entire Picture: Symptom Onset to Definitive Care



Can It Work in Missouri?

It already has...The year was 2005

- Location: Rural county- 22 miles out from EMS and local CAH
- 1050 hrs: 44 y/o male develops chest pain
- PMH: HTN
- 1051: Call received
- 1054: Alert dispatcher ascertains he sounds sick and activates ground and air by the criteria we have all agreed upon through SAC

Case Example

- 1121: Simultaneous air and ground arrival
- 1130: Depart scene by air---12 lead shows inferior STEMI
- Enroute, standard care administered, and hospital notified
- 1158: Arrive hospital
- Cardiologist meets patient in ED, brief exam, and transfer to cath lab

Case Example

- Cath team has cleared a table prospectively
- 1225 Needle time
- 1235 Lesion time
- 1237 Balloon time
- LOS -2 days!
- Post cath EF >50%

Case Example-Savings

- Acute: 1-2 days on LOS, \$5-15,000
- Long Term: We saved the function of a 44 y/o patient who is back at work as a productive member of society instead of on disability. Estimated total health care expenditures on disability for 30 years is \$345,000.00. Doesn't count tax revenue loss and quality of life.

Think About These Points

- This case demonstrates what can happen when we focus on the outcome of the entire system.
- A patient had a symptom onset to balloon time of 107 minutes—from rural Missouri!
- Outstanding!

**The concept is simple, but
accomplishing it won't be easy.
Your goal is to focus on
designing a system that provides
our patients:**

**The Right Care,
at the Right Place,
at the Right Time.**